We Claim:

1. A selective hopping method for hit avoidance in a frequency hopping spread spectrum communication system utilizing an original hopping sequence, the communications system having a plurality of available channels for receiving signal packet traffic utilizing a plurality of receiving signal slots, the plurality of available channels all being available for use in frequency hopping, comprising the steps of;

(1.1) dividing the plurality of available channels into a plurality of partitions;

(1.2) determining a combination of said plurality of partitions in a predetermined distribution based on the number of channels in each of said plurality of partitions;

(1.3) forming a partition sequence by assigning each of said plurality of partitions into a plurality of preselected receiving signal slot sets based on said combination; and

(1.4) generating a generated hopping sequence by partition mapping from the original hopping sequence, wherein said partition mapping is responsive to said partition sequence.

2. The method of claim 1, wherein said step (1.1) further comprises the steps of:

(2.1) defining an interference collision ratio being the number of the measured interference divided by the number of selected received signal packets subtracting the number of unknown events, wherein an unknown event has a received signal power less than said first predetermined threshold;

(2.2) grouping said plurality of available channels having values of interference

collision ratio within a predetermined range into the same one of said plurality of partitions.

3. The method of claim 1, wherein said step (1.2) further comprises the steps of :

(3.1) dividing said distribution into a plurality of superframes ;

(3.2) dividing each of said plurality of superframes into a plurality of frames;

(3.3) dividing each of said plurality of frames into a plurality of MAUs, each of said plurality of frames including a predetermined number of said plurality of MAUs, and said plurality of superframes including a predetermined number of said plurality of frames;

(3.4) determining the number of MAUs for each of said partitions; and

(3.5) distributing said MAUs of each of said partitions into a selected plurality of said frames.

4. The method of claim 3, wherein said step (1.3) comprises defining a first kind of priority to said plurality of selected receiving signal slot sets, and defining a second kind of priority to said plurality of partitions.

5. The method of claim 4, further comprising the steps of designating a predetermined number of said plurality of MAUs of each of said plurality of partitions to said selected receiving signal slot sets such that a receiving signal slot having a higher value of said first kind of priority is designated by a MAU of partition having a higher value of said second kind of priority.

6. The method of claim 3, wherein said step (3.5) further comprises the steps of :

(6.1) distributing a predetermined number of said plurality of MAUs in one of said plurality of partitions uniformly into all of said plurality of frames; and

(6.2) distributing a plurality of residue MAUs, said residue MAUs being a plurality of said plurality of MAUs not having been distributed in said step (6.1),

7. The method of claim 6, wherein said step (6.2) further comprises the steps of :said residue MAUs being distributed evenly across a plurality of said plurality of framesMAUs.

8. The method of claim 7, further comprising the steps of :

(8.1) determining a minimum spacing for distribution of said plurality of residue MAUs;

(8.2) distributing said residue MAUs into said plurality of frames spaced equally with said minimal spacing; and

(8.3) distributing a plurality of said residue MAUs having not been distributed in said step (8.2) into a plurality of said frames having not been distributed in said step (8.2).

9. The method of claim 2, further comprising the step of determining errors in a received signal packet by an error detection method, wherein received signal packets having errors are designated as interference events, and received signal packets having no errors are designated as interference-free events.

10. The method of claim 9, wherein said step of determining errors in a received signal packet further comprises the step of determining whether the received signal packet power is larger than a first predetermined threshold, whereby the received signal packet is designated as an unknown event if its received signal power is less than said first predetermined threshold, and the received signal packet is designated as an interference event if its received packet signal power is larger than said first

predetermined threshold, and the received signal packet has an error being detected responsive to said error detecting method, whereby the received signal packet is designated as an interference-free event if the received packet signal power is larger than said first predetermined threshold and the received signal packet has no error being detected responsive to said error detecting method.

11. The method of claim 10, wherein said error detection method utilizes HEC.

12. The method of claim 10, wherein said error detection method utilizes CRC.

13. The method of claim 10, wherein said error detection method utilizes FEC.

14. The method of claim 10, wherein said error detection method utilizes a combination of HEC, CRC, and FEC.

15. The method of claim 2, wherein the step of determining interference in a received packer further comprises the steps of:

(15. 1) measuring a signal strength in a channel silent time, said channel silent time being a predetermined interval having no transmission signals; and

(15. 2) designating a received signal packet as an interference event if the signal power of the received signal packet in said channel silent time is larger than a second predetermined threshold; and designating the received packet of signals as an interference-free event if the signal power of the received packet of signals in said channel silent time is less than said second predetermined threshold.

16. The method of claim 10 or 15, further comprising the steps after step (15.2) of:

(16.1) counting the number of interference events and the number of interference-free events for each of said plurality of partitions in a predetermined

period of time,; and

(16.2) calculating an interference collision ratio for each of said plurality of channels as a ratio of the number of interference events to the sum of the number of interference events and the number of interference-free events.

17. The method of claim 2, wherein said step (2.2) further comprises the steps of:

selecting the smallest number from a predetermined set of integers indicating a limit to the number of available channels;

selecting at least one channel from said plurality of available channels responsive to the lowest values of interference collision ratios, whereby the number of said selected channels is equal to said selected smallest number;

assigning an upper bound and a lower bound for the interference collision ratio for each of said plurality of partitions;

designating a channel from said plurality of selectedchannels to a selected one of said plurality of partitions responsive to the interference collision ratio of said channel being between said upper bound and said lower bound of said selected partition;

removing partitions having no channels; and re-designating partitions to fill the hole generated by a removed partition;

determining the total number of said plurality of partitions; and

determining the members and size of each of said plurality of partitions.

18. The method of claim 2, wherein said step (2.2) further comprises the steps of:

(18. 1) selecting a number of said plurality of available channels having an

interference collision ratio below a third predetermined threshold;

(18. 2) selecting a number from a set of integers indicating the number of available channels, said selected number being the largest one in said set of integers, and said selected number further being smaller than the number of said channels of step (18.1);

(18.3) selecting a number being the smallest number of said set of integers responsive to no number being generated from said step (18.2);

(18.4) assigning an upper bound and a lower bound for the interference collision ratio for each said plurality of partitions;

(18.5) designating a channel to one of said plurality of partitions as the interference collision ratio of said channel having an interference ratio being between said upper bound and said lower bound of said one of said plurality of partitions:

(18. 6) removing partitions having no channel; and re-designating partitions to fill the hole generated by a removed partition; and

(18. 7) determining the total number of said plurality of partitions, and the numbers and size of each of said plurality of partitions.

19. The method of claim 1, wherein said generated hopping sequence is utilized responsive to predetermined communication system parameters.

20. The method of claim 19, wherein said generated hopping sequence and said original hopping sequence coexist in a pico-net having a master unit selecting between said generated hopping sequence and said original hopping sequence responsive to a target communicable therewith, and a database for storing said targets that should be communicated with generated hopping sequence, thereby providing

backward compatibility.

21. The method of claim 1, wherein in said step (1.4) further comprises a step of selecting one of said plurality of available channels from one of said plurality of partitions by utilizing a probability distribution whereby each of said plurality of channels have equal probability of selection.

22. The method of claim 21, wherein said probability distribution is a discrete statistically uniform distribution mapping from all of the available channels in each of said plurality of partitions into said generated hopping sequence. .

23. The method of claim 21, wherein said probability distribution is a discrete deterministically uniform distribution mapping from all of the available channels in each of said plurality of partitions into said generated hopping sequence. .

24. The method of claim 22, wherein a pseudo-random mapping is utilized, further comprises the steps of:

(24.1) obtaining a sum value by adding a selected one of a plurality of shifter signals to a first channel number selected by said original hopping sequence, wherein each of the plurality of shifter signals is uniformly distributed within the number of channels of a corresponding one of said plurality of partitions;

(24.2) obtaining a modulus value being the remainder of dividing said sum value by a number of channels of a selected one of plurality of partitions;

(24.3) obtaining a second channel number for said generated hopping sequence by looking-up a selected one of a plurality of tables wherein said modulus value is used as a index value for table to be look up, wherein each of the plurality of tables is composed of said channels of a corresponding one of said plurality of partitions.

25. The method of claim 22, wherein an available channel of the original hopping sequence being in said partition selected by the partition sequence remains unchanged, thereby maintaining the similarity between the original hopping sequence and said generated hopping sequence.

26. The method of claim 22, wherein a plurality of shifter signals are uniformly distributed over a predetermined number of channels in a selected one of said plurality of partitions.

27. The method of claim 1, wherein further comprising a step after said step (1.4) of managing the receiving signal packet traffic whereby a receiving signal packet is transmitted only in said selected receiving signal slot sets.

28. The method of claim 27, wherein said traffic management utilizes a synchronous traffic management.

29. The method of claim 28, wherein the communications system includes a plurality of request slots, a plurality of transmission slots, and a plurality of reservation slots, said synchronous traffic management comprising the steps of:

calculating the ratio of the number of good channels from the plurality of available channels to the number of the plurality of available channels in said generated hopping sequence, thereby determining a good channel ratio, a channel being designated good having interference collision ratio below a fourth predetermined threshold, wherein an interference collision ratio is defined as the number of channels having measured interference divided by the number of all received signal packets subtracting the number of unknown events, wherein an unknown event has a received signal power less than said first predetermined

threshold;

calculating a first utilization ratio as a ratio of the number of request slots to the number of all transmission slots;

calculating a second utilization ratio as the ratio of-the number of the sum of all existent reservation slots to the number of all transmission slots; and

rejecting a request if the sum of said first and said second utilization ratios exceeds said good channel ratio.

30. The method of claim 28, wherein the communications system further includes a synchronous traffic buffer and a plurality of time slots, the method further comprising the step of selecting and transmitting a signal packet from the synchronous traffic buffer responsive to said synchronous traffic management reservation slot time slot status.

31. The method of claim 27, wherein said traffic management utilizes an asynchronous traffic management.

32. The method of claim 31, wherein said asynchronous traffic management comprises the step of transmitting received signal packets only via good channels.

33. The method of claim 31, further comprising the step of selecting an asynchronous signal packet for transmission responsive to the reservation status of the time slot and a list of said good channels .

34. The method of claim 31, further comprising the step of selecting an asynchronous received signal packet for transmission responsive to the reservation status of the time slot, a list of said good channels, and the received signal power of the received signal packet.

35. The method of claim 1, wherein the frequency hopping spread spectrum communication system is a Bluetooth communication system.

36. A selective hopping system for hit avoidance in a frequency hopping spread spectrum communication system utilizing an original hopping sequence, having a plurality of available channels for receiving signal packet traffic utilizing a plurality of receiving signal slots, the plurality of available channels all being available for use in frequency hopping, comprising;

partition generating means for dividing the plurality of available channels into a plurality of partitions;

partition distributing means coupled to said partition generating means for determining a combination of said plurality of partitions in a predetermined distribution based on the number of channels in each of said plurality of partitions;

partition sequence generating means coupled to said partition distribution means for forming a partition sequence by assigning each of said plurality of partitions into a plurality of preselected receiving signal slot sets based on said combination; and

generated hopping sequence means, coupled to said partition sequence generating means, for partition mapping from the original hopping sequence, wherein said partition mapping is responsive to said partition sequence.

37. The selective hopping system of claim 36, wherein said partition generating means further defines an interference collision ratio being the number measured interference divided by the number of selected received signal packets subtracting the number of unknown events, wherein an unknown event has a received signal power less than said first predetermined threshold; and grouping said plurality of available

channels having values of interference collision ratio within a predetermined range into the same one of said plurality of partitions.

38. The selective hopping system of claim 36, wherein said partition distributing means further comprises:

dividing means for dividing said distribution into a plurality of superframes; then dividing each of said plurality of superframes into a plurality of frames; and dividing each of said plurality of frames into a plurality of MAUs, each of said plurality of frames including a predetermined number of said plurality of MAUs, and said plurality of superframes including a predetermined number of said plurality of frames; designating a predetermined number of said plurality of MAUs to be distributed into each of said partitions;

determining means coupled to said dividing means for determining the number of MAUs for each of said partitions; and

distributing means for coupling said determining means for distributing said MAUs of each of said partitions into a selected plurality of said frames.

39. The selective hopping system of claim 38, wherein said partition sequence generating means define a first kind of priority to said plurality of selected receiving signal slot sets, and define a second kind of priority to said plurality of partitions.

40. The selective hopping system of claim 39, wherein after defining a priority, said partition sequence generating means further designates a predetermined number of said plurality of MAUs of each of said plurality of partitions to said selected receiving signal slot sets such that a receiving signal slot having a higher value of said first kind of priority is designated by a MAU of partition having a higher value of said

second kind of priority.

41. The selective hopping system of claim 38, wherein said distributing means distributes a predetermined number of said plurality of MAUs in one of said plurality of partitions in an approximately uniform way.

42. The selective hopping system of claim 37, further comprising an error determining means for determining errors in a received signal packet by an error detection method, whereby the received signal packet is designated as an unknown event if its received signal power is less than said first predetermined threshold, and the received signal packet is designated as an interference event if its received packet signal power is larger than said first predetermined threshold, and the received signal packet has an error being detected responsive to said error detecting method, whereby the received signal packet is designated as an interference-free event if the received packet signal power is larger than said first predetermined threshold and the received signal packet has no error being detected responsive to said error detecting method.

43. The selective hopping system of claim 42, wherein said error detection method utilizes HEC.

44. The selective hopping system of claim 42, wherein said error detection method utilizes CRC.

45. The selective hopping system of claim 42, wherein said error detection method utilizes FEC.

46. The selective hopping system of claim 42, wherein said error detection method utilizes a combination of HEC, CRC, and FEC.

47. The selective hopping system of claim 42, wherein error determining means

determines an error based on the signal strength of said received signal packet in a channel silent time, wherein said channel silent time is a predetermined interval having no transmission signals; and designates a received signal packet as an interference event if the signal power of the received signal packet in said channel silent time is larger than a second predetermined threshold; and designates the received packet of signals as an interference-free event if the signal power of the received packet of signals in said channel silent time is less than said second predetermined threshold.

48. The selective hopping system of claim 42 or 47, further comprising:

counting means for counting the number of interference events and the number of interference-free events for each of said plurality of partitions in a predetermined period of time; and

first calculating means coupled to said counting means for calculating an interference collision ratio for each of said plurality of channels as a ratio of the number of interference events to the sum of the number of interference events and the number of interference-free events.

49. The selective hopping system of claim 47, wherein channels having an interference collision ratio within a predetermined range is classified to a same partition.

50. The selective hopping system of claim 36, wherein said generated hopping sequence means further comprises a step of selecting one of said plurality of available channels from one of said plurality of partitions by utilizing a probability distribution whereby each of said plurality of channels have equal probability of selection.

51. The selective hopping system of claim 36, further comprising a traffic management means coupled to said generated hopping sequence means for managing the receiving signal packet traffic, whereby the receiving signal traffic is transmitted in said selected receiving signal slot sets.

52. The selective hopping system of claim 51, wherein said traffic management means utilizes a synchronous traffic management.

53. The selective hopping system of claim 52, wherein the communications system includes a plurality of request slots, a plurality of transmission slots, and a plurality of reservation slots, said traffic management means comprises:

second calculating means for calculating the ratio of the number of good channels from the plurality of available channels to the number of the plurality of available channels in said generated hopping sequence, thereby determining a good channel ratio, a channel being designated good having interference collision ratio below a fourth predetermined threshold;

third calculating means for calculating a first utilization ratio as a ratio of the number of request slots to the number of all transmission slots;

fourth calculating means for calculating a second utilization ratio as the ratio of the number of the sum of all existent reservation slots to the number of all transmission slots; and

rejecting means coupled to said second, third and fourth calculating means for rejecting a request if the sum of said first and said second utilization ratios exceeds said good channel ratio.

54. The selective hopping system of claim 52, wherein the communications

system further includes a synchronous traffic buffer and a plurality of time slots, the traffic management means further selects and transmits a signal packet from the synchronous traffic buffer responsive to said synchronous traffic management reservation slot time slot status.

55. The selective hopping system of claim 52, wherein said traffic management means utilizes an asynchronous traffic management.

56. The selective hopping system of claim 55, wherein said asynchronous traffic management transmits received signal packets only via good channels.

57. The selective hopping system of claim 55, wherein said traffic management means selects an asynchronous signal packet for transmission responsive to the reservation status of the time slot and a list of said good channels.

58. The selective hopping system of claim 36, wherein the frequency hopping spread spectrum communication system is a Bluetooth communication system.

59. A selective hopping system for hit avoidance in a frequency hopping spread spectrum communication system utilizing an original hopping sequence, having a plurality of available channels for receiving signal traffic with a plurality of receiving signal slots, the plurality of available channels all being available for use in frequency hopping, comprising

a hopping sequence generator having an input from a hop clock;

a partition sequence change processor for providing a process for changing partition sequence;

a partition sequence generator having inputs from said hop clock, a traffic requirement, and a channel partitioning circuit, and said partition sequence generator

generating a partition sequence;

an original / mapped sequence selector having an input from said partition sequence change processor for selecting a hopping sequence;

a partition mapper having inputs from said hopping sequence generator and said partition sequence generator, and an original / mapped sequence selector; and said partition mapping circuit serving to map said partition sequence into a generated hopping sequence;

a multiplexer receiving the signals from said hopping sequence generator, said partition mapper and said original / mapped sequence selector for multiplexing an input signal;

a frequency synthesizer receiving an output from said multiplex and outputting a continuous sinusoidal signal with a frequency being determined by the current channel number from a hopping sequence;

a mixer receiving an RF input signal and mixing said RF input signal with the signals from said frequency synthesizer, wherein a mixed signal is converted to a lower and fixed intermediate frequency signal;

a channel quality / interference level measurement circuit for measuring channel qualities and interference levels; and

a channel partitioner for receiving inputs from said channel quality / interference level measurement circuit and then dividing said available channels into various partitions so as to be provide to the partition sequence generator.

60. The selective hopping system of claim 59, wherein said channel partitioner divides the plurality of available channels into a plurality of partitions.

61. The selective hopping system of claim 59, wherein said partition sequence generator distributing the available channels in each of said plurality of partitions into a predetermined distribution; and forming a partition sequence by assigning a predetermined number of channel to a plurality of selected receiving signal slot sets.

62. The selective hopping system of claim 59, wherein hopping sequence generator generates a generated hopping sequence by partition mapping from the original hopping sequence, wherein said partition mapping is responsive to said partition sequence.